

Supporting Information

Turn-on Voltage Shift of Metal-Insulator-Oxide Semiconductor Thin-Film Diode by Adding Schottky Diode in Reverse Direction

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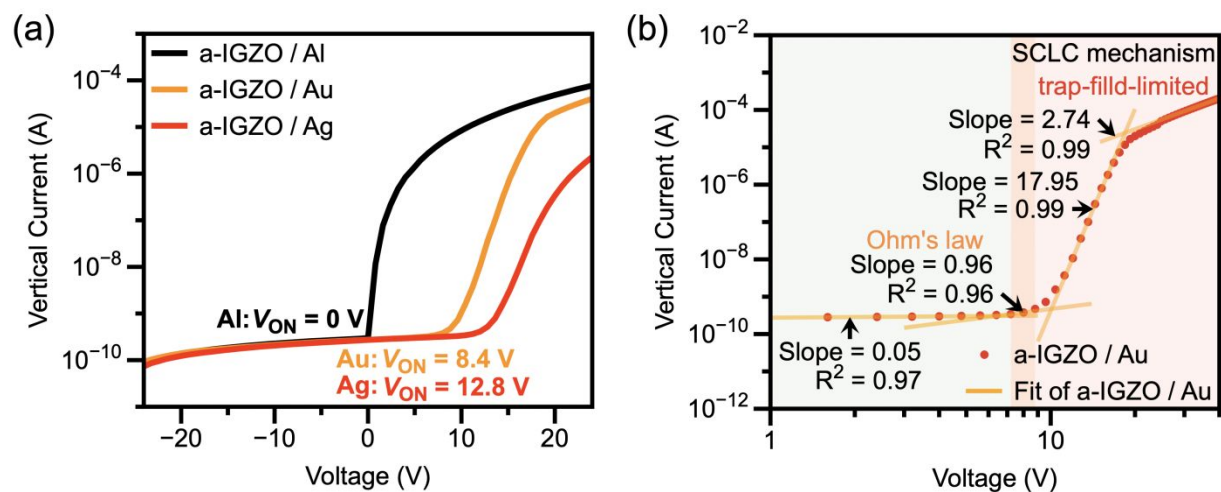


Figure S1. Vertical current-voltage (I-V) plots of the a-IGZO-based thin-film diodes (TFDs) measured at room temperature; (a) turn-on voltage variation depending on the top metal electrodes such as Al (0 V), Ag (12.8 V), and Au (8.4 V). (b) electrical characteristics of the TFD with Au electrode.

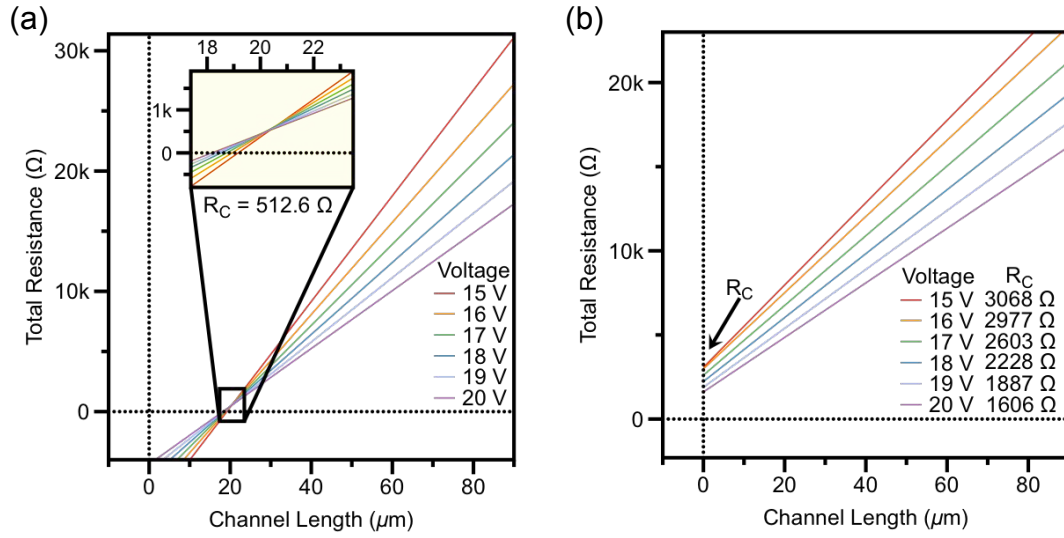


Figure S2. Measuring the contact resistance (R_C) of ZnO/Al and ZnO/Ag via transmission-line method (TLM) (a) Total resistance (R_T) of ZnO/Al as a function of channel length (L). Inset: R_C between ZnO/Al. (b) R_T and R_C of ZnO/Ag.

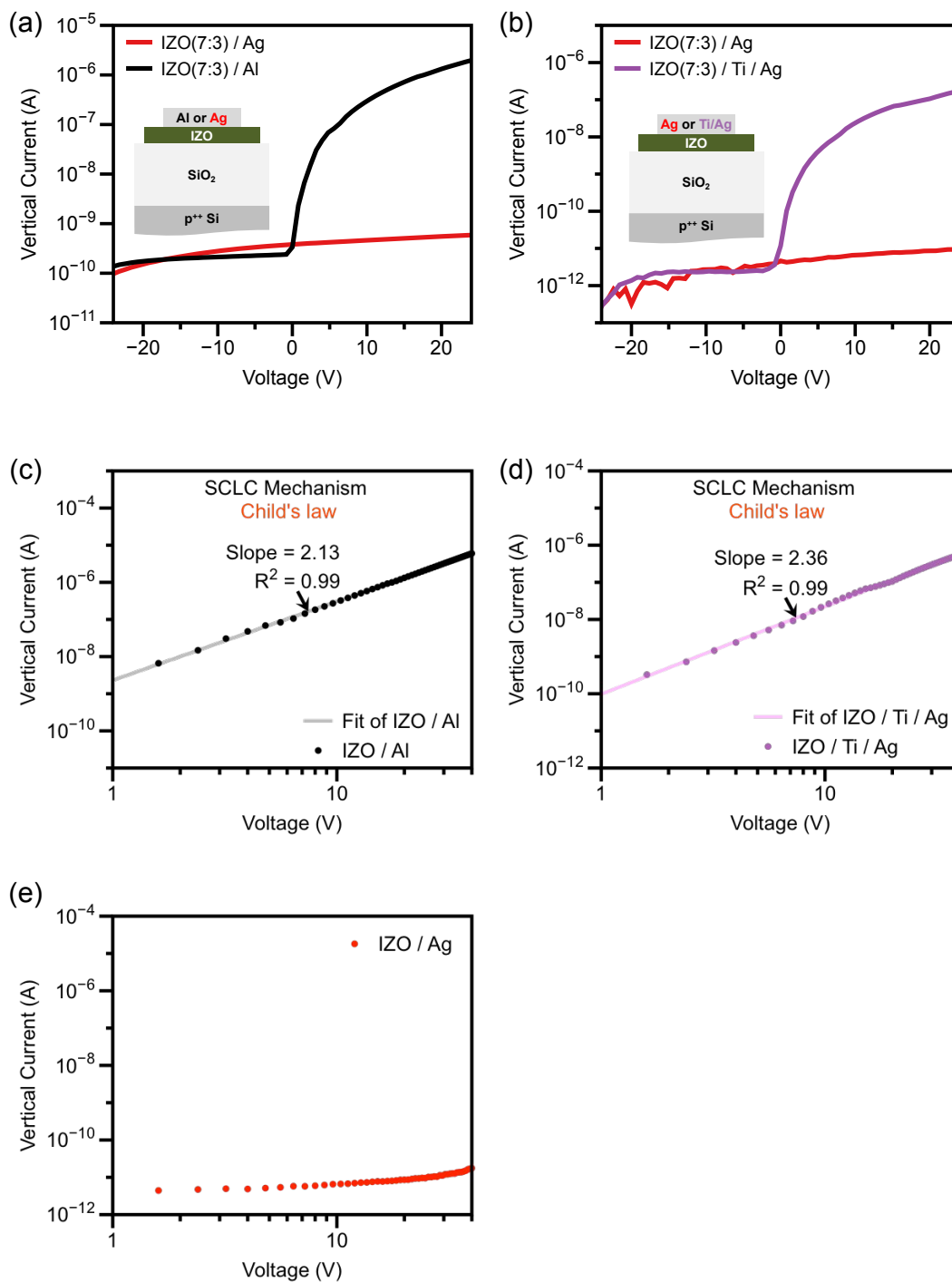


Figure S3. Vertical I-V relationships of IZO-based TFDs depending on the top metal electrodes; (a) Al vs Ag and (b) Ag vs Ti/Ag. I-V relationship of the TFDs on a logarithmic scale with (c) IZO/Al, (d) IZO/Ti/Ag, and (e) IZO/Ag.

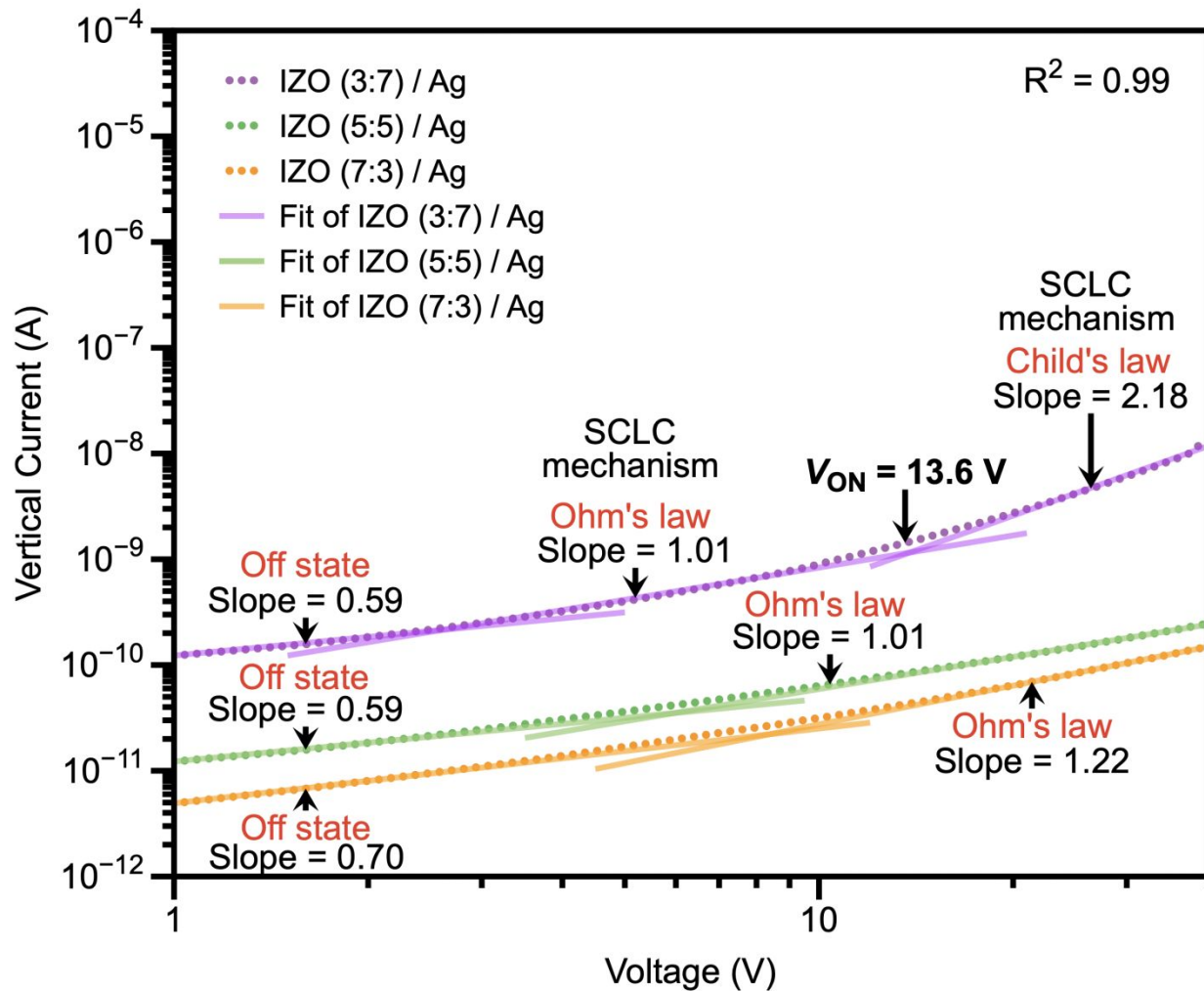


Figure S4. Vertical I-V relationships of IZO-based TFDs depending on the different ratio of indium to zinc ($I_{0.3}Z_{0.7}O$, $I_{0.5}Z_{0.5}O$, and $I_{0.7}Z_{0.3}O$) with Ag electrode; Comparison of the amount of thermionic emission in the off state of positive bias depending on the relative content of indium; Comparison of the starting voltage of Ohm's law according to indium content difference under positive bias.

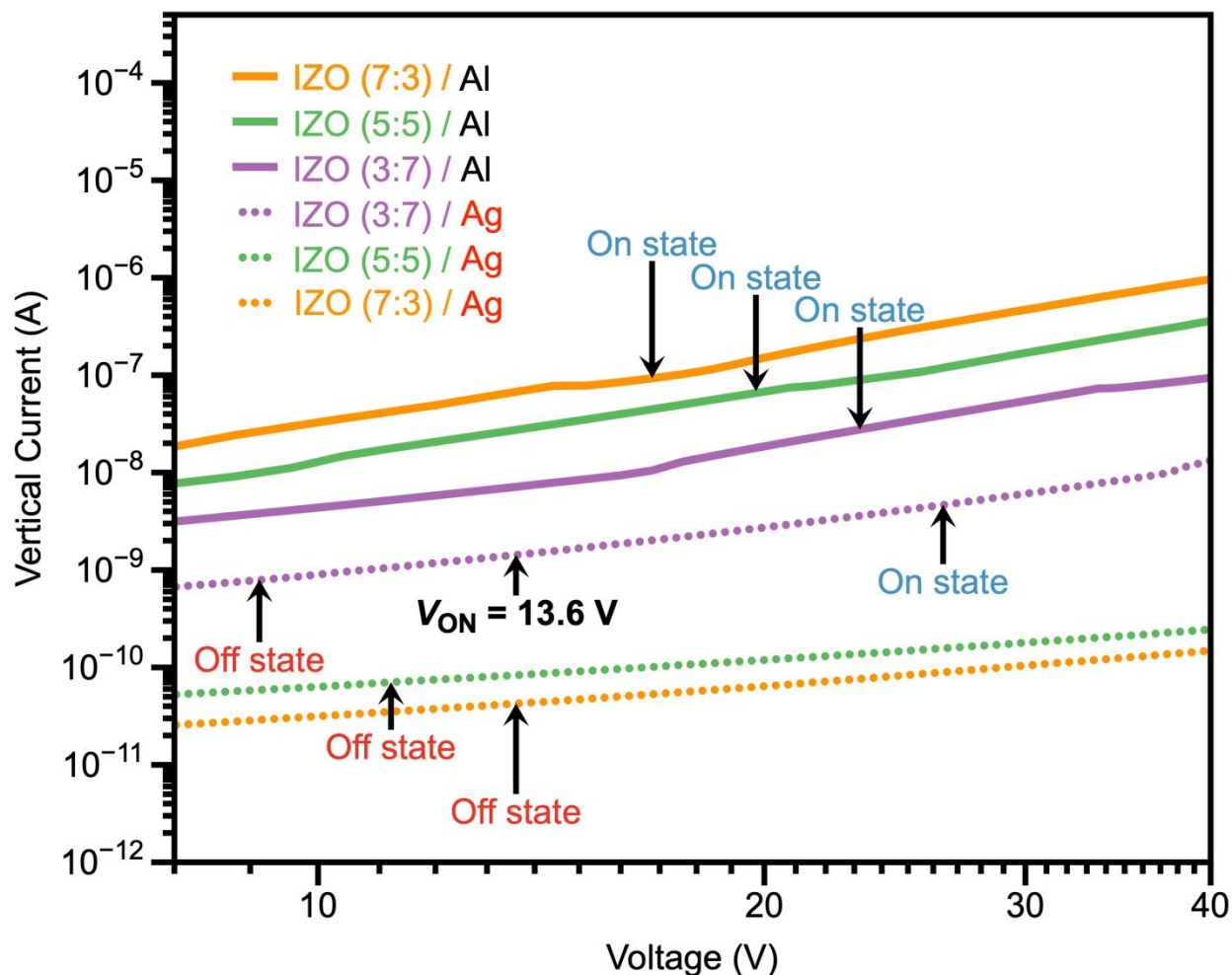


Figure S5. Vertical I-V relationships of IZO-based TFDs depending on the different ratio of indium to zinc ($I_{0.3}Z_{0.7}O$, $I_{0.5}Z_{0.5}O$, and $I_{0.7}Z_{0.3}O$) with Al and Ag electrode; On-current comparison of IZO/Al with different indium contents under positive bias (solid line); Comparison of IZO (7:3)/Ag and IZO (5:5)/Ag which maintains the off state and IZO (3:7)/Ag where the turn-on is present.